SOLID INSECTICIDAL FORMULATION

This is a continuation of application Ser. No. 08/351,964 filed on Dec. 8, 1994, now abandoned.

The present invention relates to a solid insecticidal formulation and, more particularly, relates to the use of such a formulation in the treatment of animals.

Animals, for example cattle, need to be periodically externally treated with an insecticide in order to combat ectoparasitic pests. One widely used method of contacting animals with an insecticide involves dispersing the insecticide in water in a large tank and then immersing the animals in the liquid in the tank.

Concentrated liquid insecticidal formulations are often used for delivering an insecticide to the water in the tank. However, liquid formulations in the form of emulsifiable concentrates contain a very high proportion of organic solvent (often up to 80 percent) which are increasingly coming under scrutiny for their effect on the environment; emulsion concentrates have a higher water content but still contain organic solvents. Suspension concentrates, another water-based liquid form, are often viscous giving rise to handling problems and loss of active ingredient through retention in the packaging.

A further problem associated with some liquid formulations when used in a tank in which animals are immersed is that of the loss of active ingredient by adsorption to the animals (known as "stripping"). This necessitates replenishment of the tank with active ingredient at shorter intervals than would otherwise be required.

It is an object of the present invention to provide an insecticidal formulation for use in the treatment of animals which is easy to handle and transport, is highly active and has a low susceptibility to stripping.

According to the invention, there is provided a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide for use in the treatment of animals.

The invention extends to an aqueous dispersion prepared by dispersing a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide in water for use in the treatment of animals.

The invention extends to the use of polyvinylpyrrolidone and a pyrethroid insecticide for the preparation of a solid formulation for the treatment of animals.

The invention extends to the use of a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide for the preparation of an aqueous dispersion for the treatment of animals.

The invention extends to the use of an aqueous dispersion prepared by dispersing a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide in water for the treatment of animals.

The invention extends to a method of treating animals, the method comprising administering to the animals a liquid formulation prepared by dispersing a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide in water.

The invention extends to a method of combating insects associated with animals, the method comprising treating the animals with a liquid formulation prepared by dispersing a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide in water.

The solid formulation of polyvinylpyrrolidone and pyrethroid insecticide has, surprisingly, been found to be highly advantageous in the treatment, particularly the therapeutic treatment, of animals. For example, a dispersion of the solid formulation has been found to have unexpectedly high insecticidal activity and a low susceptibility to stripping.

Preferably, the animals are treated against acarid pests. The acarid pests may be ticks.

Preferably, the animals are treated against ectoparasites.

The animals are preferably mammals. The animals are preferably bovine.

Animals, for example cattle, are often treated with an insecticide by immersing the animals in a liquid which includes the insecticide. The liquid is suitably held in a receptacle known as a "dip" tank.

The invention extends to a method of delivering an insecticide to a liquid in a receptacle, for example a dip tank, the method including the step of dispersing a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide in receptacle liquid.

Preferably, in the method, said receptacle liquid is present in the receptacle prior to the step of dispersing said solid formulation in said receptacle liquid.

The invention extends to a receptacle for immersing animals, the receptacle containing a liquid insecticidal dispersion prepared by dispersing a solid formulation which comprises polyvinylpyrrolidone and a pyrethroid insecticide in water.

A broad range of pyrethroid insecticides for use in the present invention are disclosed in the following publications: U.K. Patent Application No. 1 413 491 (NRDC), European Patent Application. No. 22382 (FMC), European Patent Application No. 107296 (ICI), U.K. Patent Application No. 1 565 932 (Bayer), U.K. Patent Application No. 1 439 615 (Sumitomo), U.K. Patent Application No. 1 560 303 (Sumitomo), U.K. Patent Application No. 2 013 206 (Sumitomo), and U.K. Patent Application No. 2 064 528 (Shell).

Examples of commercial pyrethroid insecticides for use in the present invention include: 5 -benzyl-3-furylmethyl(E) -(1R)-cis-2,2-dimethyl-3-(2-oxothiolan-3-ylidenemethyl) cyclopropanecarboxylate; permethrin (3 -phenoxybenzyl (1RS)-cis-trans-3- (2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate); fenpropathrin ((RS)-α-cyano-3-phenoxybenzyl 2,2,3,3-tetramethylcyclopropanecarboxylate); esfenvalerate ((S)-α-cyano-3 -phenoxybenzyl(S)-2(4 -chlorophenyl)-3-methylbutyrate); fenvalerate ((RS)-cyano-3-phenoxybenzyl (RS)-2-(4-chlorophenyl)-3-methylbutyrate); cyfluthrin ((RS)-α-cyano-4-fluoro-3-phenoxybenzyl(1RS)-cis-trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate); beta-cyfluthrin (a reaction mixture comprising two enantiomeric pairs in approximate ratio 1:2, i.e. (S)-α-cyano-4-fluoro-3-phenoxybenzyl(1R)-cis-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate and (R)-α-cyano-4-fluoro-3-phenoxybenzyl(1S)-cis-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate with (S)-α-cyano-4-fluoro-3-phenoxybenzyl (1R)-trans-3-(2,2-dichlorovinyl))-2,2-dimethylcyclopropanecarboxylate and (R)-α-cyano-4-fluoro-3-phenoxybenzyl(1S)-trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate); lambda-cyhalothrin (a reaction product comprising equal quantities of (S)-α-cyano-3-phenoxybenzyl(Z)-(1R)-cis-3-(2-chloro-3,3,3-trifluoropropenyl)-2,2-dimethylcyclopropanecarboxylate and (R)-α-cyano-3-phenoxybenzyl(Z)-(1S)-cis-3-(2-chloro-3,3,3-trifluoropropenyl)-2,2-dimethylcyclopropanecarboxylate); cyhalothrin ((RS)-α-cyano-3-phenoxybenzyl(Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoropropenyl)-2,2-dimethylcyclopropanecarboxylate); deltamethrin ((S)-α-cyano-3-phenoxybenzyl(1R)-cis-3-(2,2-dibromovinyl)-2,2-dimethylcyclopropanecarboxylate); cypermethrin ((RS)-α-cyano-3-phenoxybenzyl(1RS)-cis-